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A.V. Karapetyan

Global qualitative analysis of the tippe-top dynamics.

Intelligent Mechanics in Robotics

The tippe-top is dynamically and geometrically symmetric rigid body on the horizontal plane. If one makes the tippe-top rotate fastly about its vertically directed axis of symmetry, when the center of mass is in the lowest position, it would turn over and start to rotate about vertically directed axis of symmetry, the center of mass being in the highest position. The local analysis of tippe-top dynamics (in the neighborhood of its rotations about vertically directed axis of symmetry) was done by Contensou (1963).

The simplest model of the tippe-top is dynamically symmetrical non-homogenous spherical solid; the center of mass belongs to symmetry axis and does not coincide with geometrical center. The friction forces are modeled by Contensou – Zhuravlev dry friction law. The global qualitative analysis is based on considering the energy and the projection of kinetic moment to the contact point radius vector. The transition to the overturned position and back is explained completely.

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